



# Piscataqua River Project



UEK Corporation  
Annapolis, MD



# UEK Corporate Description

- Maryland Corporation
- Clean & renewable energy solutions at competitive cost
- Development & implementation of hydro-kinetic technology



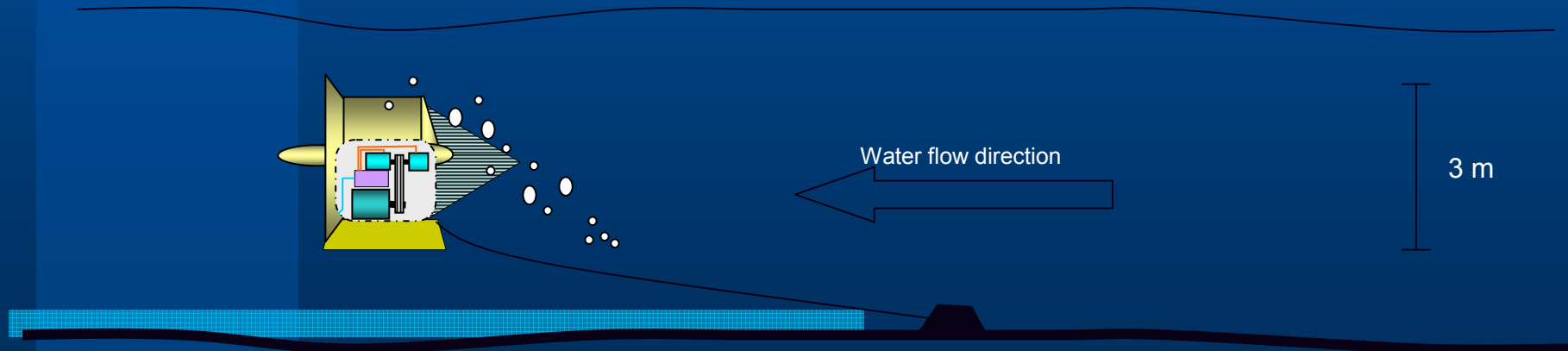
# Product and Technology

- The UEK®System is an enhanced energy converter of kinetic energy contained in rivers and tidal flow.
- Patented technology: “Bi-Directional Hydroturbine Assembly For Tidal Deployment”  
No:- 6,139,255 - October 31, 2000 (USA)
- One of several patents



# UEK System Description

- **“UEK” is an acronym for “Underwater Electric Kite”**
  - **Machines are anchored by cables (or on a fixed structure) and water passes through the machine housing, turning a propeller turbine generator.**
  - **UEK machines are semi-buoyant and hover below water surface, with a submarine power cable connected to shore controls, converter and grid or end-user.**
  - **Patented augmentor ring and shroud design accelerate water flow through machine increasing output.**
  - **Counter rotating runner (patented) of twin unit cancel torque.**
  - **Suggested water velocities of at least 2 m/s with depths of + 4 m for a standard system.**



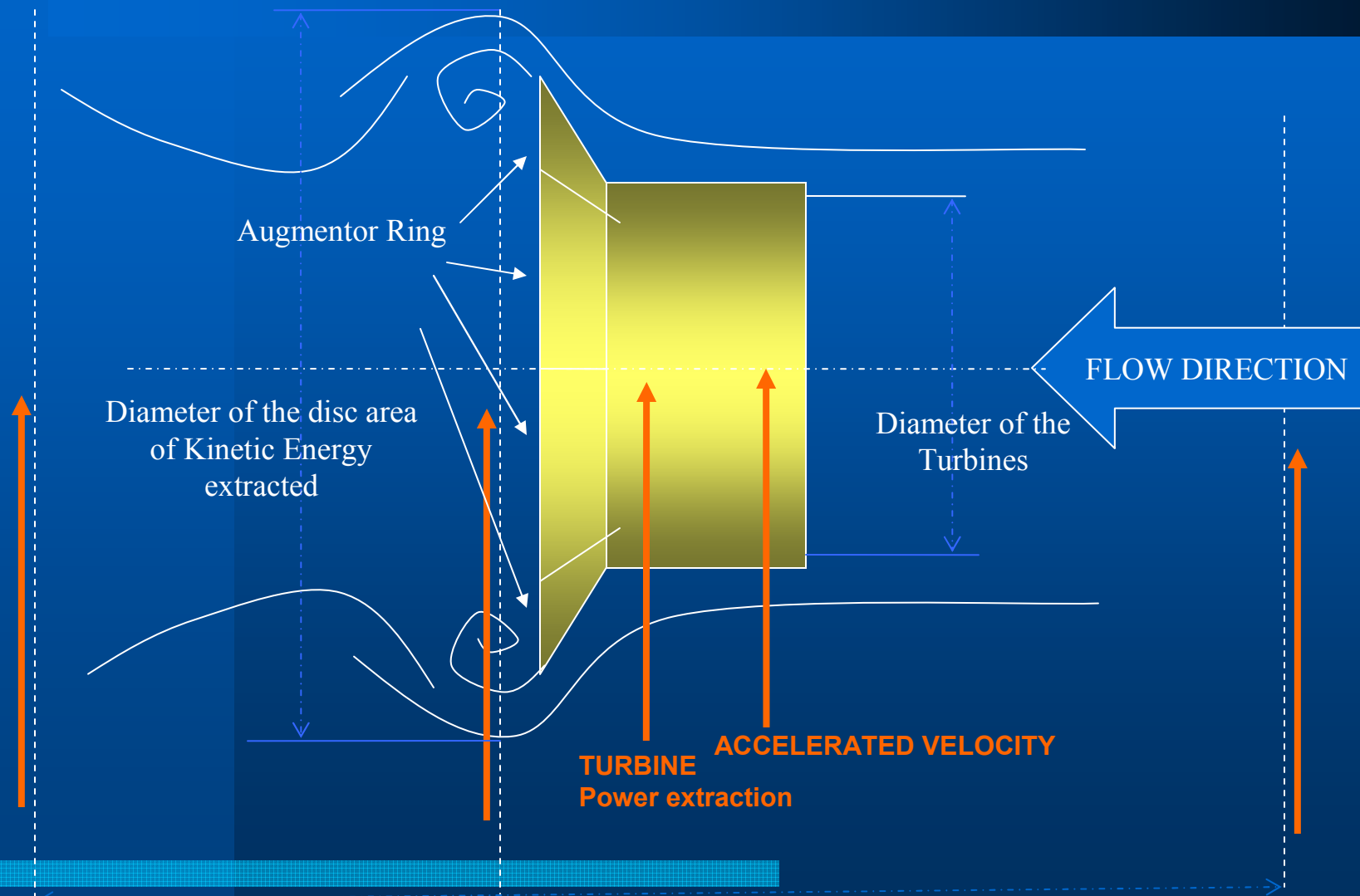
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Ambient Velocity

Low pressure & velocity

Ambient Velocity



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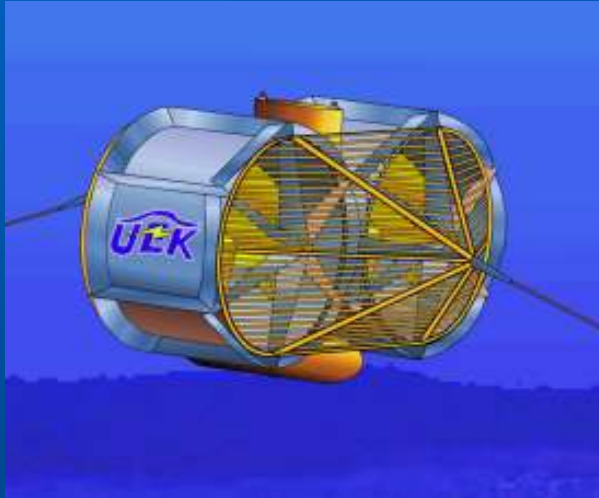


# Nova Scotia Dept. Of Energy

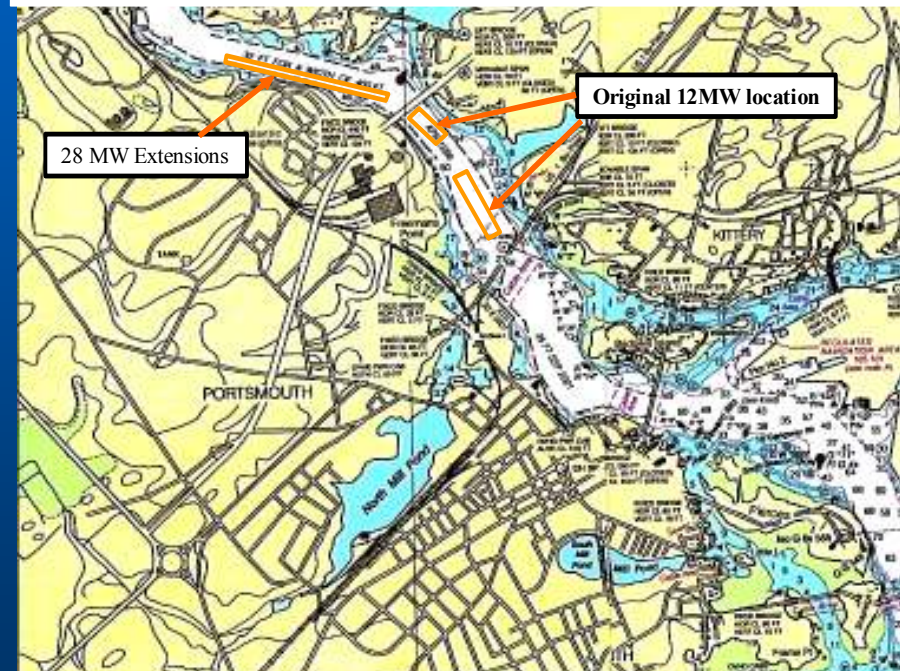
- **UEK** is one of three companies chosen by the Nova Scotia Department of Energy to demonstrate tidal technology at the Minas Basin Hub to be built in the Bay of Fundy



# Project Location Map



Section 18.



Map of the site illustrating clearly the "foot print" of the  
**PROPOSED PROJECT**

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## Goals:

- **Display responsible & innovative use of natural resources**
- **Harness the tremendous tidal power flow of the Piscataqua River**
- **Create local work opportunities**





# Project Forecasts

- **Piscataqua River:**  
**40MW installed**  
**120 Units @336.8 kW/h each = 40,416 kWe**  
  
**226,588,262 kWh\*/year**  
**new electric generation available for sale**  
**(64% of the time on line)**  
  
**Rule of thumb: 1kW powers ~ 1 household**

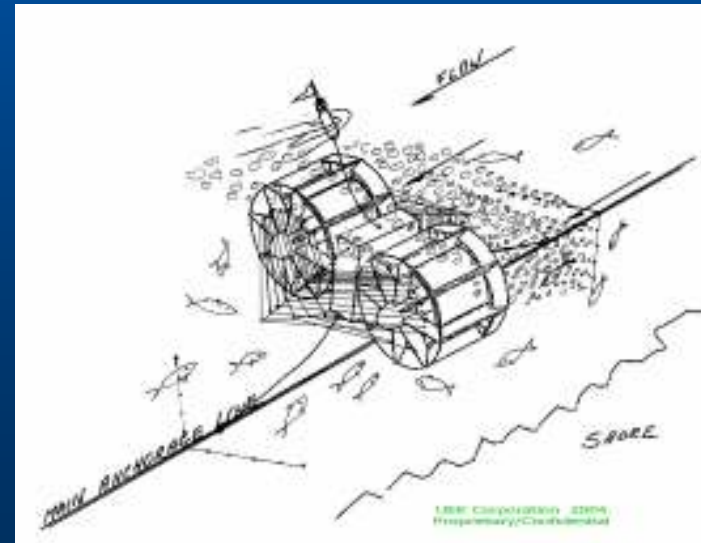


# Areas of Concern (general)

## ● Environmental Issues

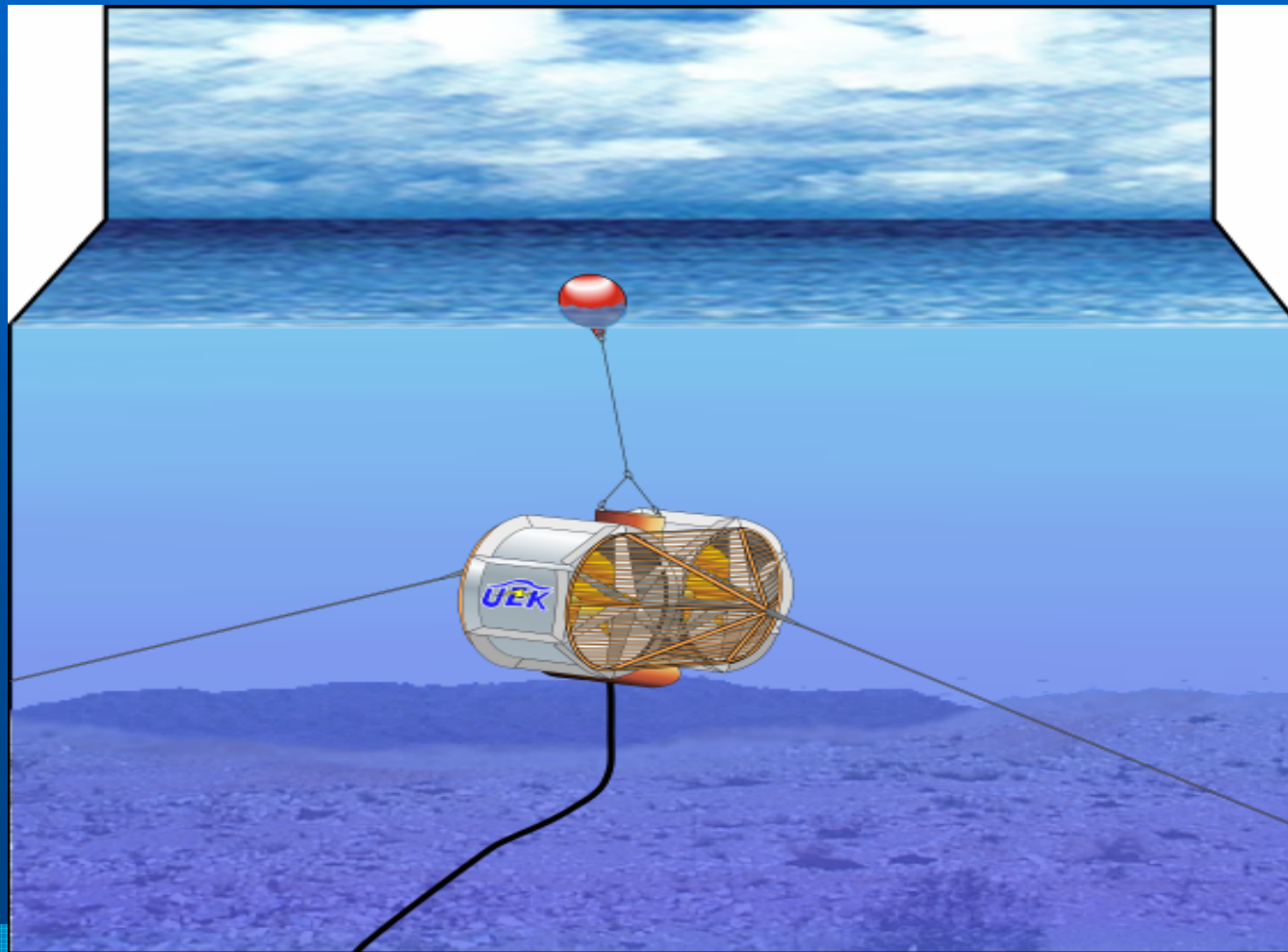
- The pressure drop through the turbines is @ 0.640 – 1.104 (under full load).... Less than the maximum authorized by FERC for hydro plant draw tubes.

## ● Installation Issues





# Tidal Unit

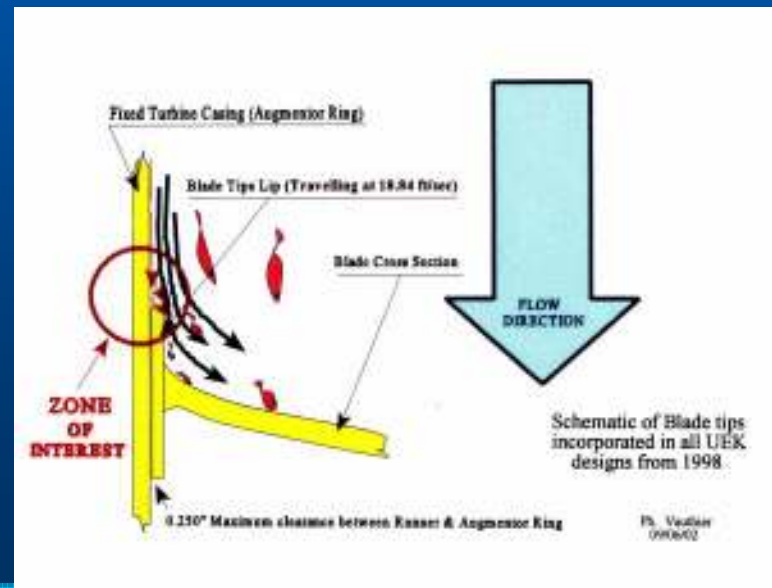


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# Environmental Issues

- Fish & wildlife safety concerns addressed
- Noiseless and below the water's surface
- No emissions





# **Environmentally Benign**

- **The turbines rotate slowly at approximately 42 revolution per minute under full load.**
- **No permanent alteration of the deployment site.**
- **Screens prevent entry of marine wildlife and diving seabirds.**
- **Anti-fouling coatings and lubricants used are environmentally friendly & designed for local characteristics.**
- **Minimally invasive moorings systems.**



# Environmental Issues

- EMISSIONS AVOIDENCE

- The US Department of Energy reports that annual hydro-power production for the US was 325,265 Megawatts (1). This agency also reports that Hydro-generated electricity represents avoided emissions that would otherwise be created by the burning of fossil fuels. More specifically they cite the following figures for fossil fuel emission (2):
  - Sulphur Emissions (1993) (14,428,000 tons of SO<sub>2</sub>)
  - Nitrogen Oxide Emissions (1993) (5,848,000 tons of NO<sub>x</sub>)
  - Carbon Dioxide (1993) (1,942,386,000 tons of CO<sub>2</sub>)
- Using these figures results in the following emissions avoidance per One Megawatt of power generated by the UEK®System:
  - Avoided Sulphur per Megawatt 0.0073127 tons per year SO<sub>2</sub>
  - Avoided Nitrogen per Megawatt 0.0029640 tons per year NO<sub>x</sub>
  - Avoided Carbon Dioxide per Megawatt 10.0641761 tons per year CO<sub>2</sub>
  - Avoided Sulphur 444.4584 tons of SO<sub>2</sub> annually
  - Avoided Nitrogen 180.1489 tons of NO<sub>x</sub> annually
  - Avoided Carbon dioxide 611,690.3780 tons of CO<sub>2</sub> annually
- This analysis is compiled with 1993 data. With drastic improved technology in fossil burning methods used today in electricity generation, it is conceivable that the avoidance presented herein is on a higher level than present reality.



# Installation Issues

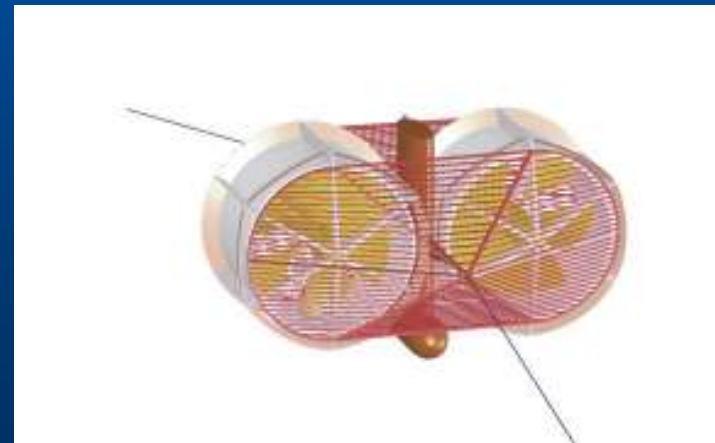
- Depth of equipment controllable
- Site identified by buoys
- Built-in drag safety margins





# Installation Issues

- Minimal land footprint
- Interconnection







# Participating Organizations

- **U.S.Army Corp of Engineers,** Permit coordination
- **Department of Natural Resources and Environmental Control**
- **Department of Interior (US Fish & Wildlife)**
- **Federal Energy Regulatory Commission**
- **U.S. Coast Guard**
- **Environmental Protection Agency**
- **States of New Hampshire & Maine**
- **Local Public Authorities**
- **The Public**



# Precedent Favorable Issues

- Permit No: 1-2002–0658, January 23, 2003 issued to Alaska Power & Telephone Company / UEK Corp., for the Eagle, Yukon River site and reissued in 2007.
- On-going R&D on instream technology for more than 23 years
- Tested equipment
- Patented technology



# Beneficial Areas of the Project

- Clean, cool, renewable energy
- High predictability of power availability
- Unobtrusive, invisible & efficient
- Eligible for carbon credit certificates
- New local employment
- **First cost effective tidal energy project in the United States**



# Project Time Line

- *~Organization~Permitting~Financing~*
- **Phase I - Feasibility**
  - Preliminary Permit
  - Notices to stakeholders
  - 90 day monitoring of site
  - Required local permits



# Project Time Line

- **Phase II – Pilot Unit**

- Upon approval of agencies:
- Build and install prototype
- Testing and gathering of data
- Environmental studies as required
- Meet with and inform agencies of findings



# Project Time Line

- **Phase III –**
  - Environmental reports to agencies
  - Prepare FERC license application
  - FERC issues license with EA



# Project Time Line

## ● Phase IV –

- Obtain land use permits for onshore facility
- Meet with local utility for interface requirements or plan to deliver power to a local industry.
- Build and install additional turbines
- Connect turbines to the grid



# Players in the Project Financing

- Local investors
- Local utilities
- Investment groups, syndication etc.,
- Manufacturers, suppliers & others interested in diversification of investment





# Next Steps

- **Continue the permit application process**

## *Conjointly:*

- ✓ **Firm up the financial planning**
- ✓ **Collect data, site information & historical precedents**
- ✓ **Prepare a site specific statement of work – SOW**
- ✓ **Adapt existing UEK®System designs to this specific site**
- ✓ **Study and finalize anchorage & interconnection issues**



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